DOCUMENT RESUME

ED 059 776 PS 005 411

AUTHOR Wilder, Larry
TITLE Speech Processes and Cognitive Learning in Young Children: Needs and Specifications.
INSTITUTION Wisconsin Univ., Madison. Research and Development Center for Cognitive Learning.
SPONS AGENCY Office of Education (DHEW), Washington, D.C.
REPORT NO Working Pap-75
BUREAU NO BR-5-0216
PUB DATE Sep 71
CONTRACT OEC-5-10-154
NOTE 17p.

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Cognitive Processes; *Elementary Education; Learning Processes; Objectives; *Preschool Children; Projects; Research Design; *Research Needs; *Speech Skills

ABSTRACT

The need for research on speech processes and cognitive learning in young children, as well as the background for such a project within the Wisconsin Research and Development Center for Cognitive Learning, is presented. The first chapter deals with the nature and rationale of the research project, the relation of this project to other research projects, and the implications of this project for elementary education. The second chapter describes the research conducted by the writer since his appointment as Principal Investigator at the Wisconsin Research and Development Center for Cognitive Learning. The third chapter describes the research to be conducted on this project. The studies for FY 72 are also discussed. (Author/CK)

ED 059776

BR-5-0216
WP-75

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

Working Paper No. 75

SPEECH PROCESSES AND COGNITIVE LEARNING IN YOUNG CHILDREN: NEEDS AND SPECIFICATIONS

By Larry Wilder

Report from the Project on Variables and
Processes in Cognitive Learning

Project Investigators: Herbert J. Klausmeier, Robert E. Davidson, Joel R. Levin, Thomas A. Romberg, B. Robert Tabachnick, Alan M. Voelker, Larry Wilder, Peter Wolff
Technical Development Section Director: Mary R. Quilling
Research Associate: Dorothy A. Frayer

Wisconsin Research and Development
Center for Cognitive Learning
The University of Wisconsin
Madison, Wisconsin

September, 1971

PS 005411

Published by the Wisconsin Research and Development Center for Cognitive Learning, supported in part as a research and developmen center by funds from the United States Office of Education, Department of Health, Education, and Welfare. The opinions expressed herein do not necessarily reflect the position or policy of the Office of Education and no official endorsement by the Office of Education should be inferred.
Center No. C-03/Contract OE 5-10-154

NATIONAL EVALUATION COMMITTEE

Samuel Brownell
Professor of Urban Education
Graduate School
Yale University

Launor F. Carter
Senior Vice President on Technology and Development
System Development Corporation

Francis S. Chase
Professor
Department of Education
University of Chicago

Henry Chauncey
President
Educational Testing Service

Martin Deutsch
Director, Institute for Developmental Studies
New York Medical College

Jack Edling
Director, Teaching Research Division
Oregon State System of Higher Education

Elizabeth Koontz
Wage and Labor Standards Administration, U.S. Department of Labor, Washington

Roderick McPhee
President
Punahou School, Honolulu

G. Wesley Sowards
Director, Elementary Education
Florida State University

Patrick Suppes
Professor
Department of Mathematics
Stanford University

***Benton J. Underwood**
Professor
Department of Psychology
Northwestern University

RESEARCH AND DEVELOPMENT CENTER POLICY REVIEW BOARD

Leonard Berkowitz
Chairman
Department of Psychology

Archie A. Buchmiller
Deputy State Superintendent
Department of Public Instruction

Robert E. Grinder
Chairman
Department of Educational Psychology

Russell J. Hosler
Professor, Curriculum and Instruction

Clauston Jenkins
Assistant Director
Coordinating Committee for Higher Education

Herbert J. Klausmeier
Director, R & D Center
Professor of Educational Psychology

Stephen C. Kleene
Dean, College of Letters and Science

Donald J. McCarty
Dean
School of Education

Ira Sharkansky
Associate Professor of Political Science

B. Robert Tabachnick
Chairman, Department of Curriculum and Instruction

Henry C. Weinlick
Executive Secretary
Wisconsin Education Association

M. Crawford Young
Associate Dean
The Graduate School

EXECUTIVE COMMITTEE

Edgar F. Borgatta
Brittingham Professor of Sociology

Anne E. Buchanan
Project Specialist
R & D Center

Robin S. Chapman
Research Associate
R & D Center

Robert E. Davidson
Assistant Professor, Educational Psychology

Frank H. Farley
Associate Professor, Educational Psychology

Russell J. Hosler
Professor of Curriculum and Instruction and of Business

***Herbert J. Klausmeier**
Director, R & D Center
Professor of Educational Psychology

Wayne Otto
Professor of Curriculum and Instruction (Reading)

Robert G. Petzold
Associate Dean of the School of Education
Professor of Curriculum and Instruction and of Music

FACULTY OF PRINCIPAL INVESTIGATORS

Vernon L. Allen
Professor of Psychology

Ted Czajkowski
Assistant Professor of Curriculum and Instruction

Robert E. Davidson
Assistant Professor of Educational Psychology

Gary A. Davis
Associate Professor of Educational Psychology

M. Vere DeVault
Professor of Curriculum and Instruction (Mathematics)

Frank H. Farley
Associate Professor of Educational Psychology

Lester S. Golub
Lecturer in Curriculum and Instruction and in English

John G. Harvey
Associate Professor of Mathematics and of Curriculum and Instruction

Herbert J. Klausmeier
Director, R & D Center
Professor of Educational Psychology

Donald Lange
Assistant Professor of Curriculum and Instruction

James Moser
Assistant Professor of Mathematics Education; Visiting Scholar

Wayne Otto
Professor of Curriculum and Instruction (Reading)

Milton O. Pella
Professor of Curriculum and Instruction (Science)

Thomas A. Romberg
Associate Director, R & D Center
Professor of Mathematics and of Curriculum and Instruction

B. Robert Tabachnick
Chairman, Department of Curriculum and Instruction

Richard L. Venezky
Assistant Professor of English and of Computer Sciences

Alan Voelker
Assistant Professor of Curriculum and Instruction

Larry Wilder
Assistant Professor of Curriculum and Instruction

Peter Wolff
Assistant Professor of Educational Psychology

MANAGEMENT COUNCIL

Herbert J. Klausmeier
Director, R & D Center
V.A.C. Henmon Professor of Educational Psychology

Mary R. Quilling
Director
Technical Development Program

Thomas A. Romberg
Associate Director

James Walter
Director
Dissemination Program

Dan G. Woolpert
Director
Operations and Business

* COMMITTEE CHAIRMAN

STATEMENT OF FOCUS

The Wisconsin Research and Development Center for Cognitive Learning focuses on contributing to a better understanding of cognitive learning by children and youth and to the improvement of related educational practices. The strategy for research and development is comprehensive. It includes basic research to generate new knowledge about the conditions and processes of learning and about the processes of instruction, and the subsequent development of research-based instructional materials, many of which are designed for use by teachers and others for use by students. These materials are tested and refined in school settings. Throughout these operations behavioral scientists, curriculum experts, academic scholars, and school people interact, insuring that the results of Center activities are based soundly on knowledge of subject matter and cognitive learning and that they are applied to the improvement of educational practice.

This Technical Report is from the Project on Variables and Processes in Cognitive Learning in Program 1, Conditions and Processes of Learning. General objectives of the Program are to generate knowledge and develop general taxonomies, models, or theories of cognitive learning, and to utilize the knowledge in the development of curriculum materials and procedures. Contributing to these Program objectives, this project has these objectives: to ascertain the important variables in cognitive learning and to apply relevant knowledge to the development of instructional materials and to the programming of instruction for individual students; to clarify the basic processes and abilities involved in concept learning; and to develop a system of individually guided motivation for use in the elementary school.

CONTENTS

		Page
	Abstract	vii
I	Introduction	1
	Nature of the Research Project	1
	Rationale of the Research Project	2
	Relation to Other Center Research	3
	Implications for Elementary Education	3
II	Related Research from Previous Project	5
III	Research Strategy	8
	FY 72	8
	General Research Goals	10
	References	11

ABSTRACT

This paper presents the need for research on speech processes and cognitive learning in young children, as well as the background for such a project within the Wisconsin Research and Development Center for Cognitive Learning. The studies for FY 72 and the general research goals of this project are discussed.

I
INTRODUCTION

This paper presents some needs and specifications for research on speech and cognitive learning in young children. The first chapter deals with the nature and rationale of the research project, the relation of this project to other research projects, and the implications of this project for elementary education. The second chapter describes the research conducted by the writer since his appointment as Principal Investigator at the Wisconsin Research and Development Center for Cognitive Learning. Finally, the third chapter describes the research to be conducted on this project.

Nature of the Research Project

This project is proposed as an element within the basic research activities of Program I. The project will focus on the role of speech in children's cognitive learning. A theoretical model of the relationship between speech and cognitive learning will be completed by January, FY 72 (see FY 71 Project 101 Program Plan, p. 20). From this model, it is possible to generate hypotheses concerning speech behavior and learning in children of different chronological and mental ages, as well as to test these hypotheses in learning situations.

Rationale of the Research Project

In part, Program I research is concerned with generating new knowledge about cognitive skills in children and constructing theories of cognitive learning. This project, based on a considerable amount of research, views the child's speech as a crucial vehicle for the acquisition of cognitive skills necessary for conceptual learning. Children's speech is considered as an external manifestation of internal cognitive processes that are not yet fully developed.

Traditionally, theorists have viewed language as a powerful facilitator of human learning, and young children are considered "mediationally deficient" until they develop verbal skills. Bourne (1966) has characterized this development of verbal behavior as follows:

> . . . as a child matures his behavior is more and more influenced by self-generated stimuli. His own verbal behavior is the most important source of self-stimulation. Verbal responses, whether overt or implicit, mediate and regulate other overt behaviors. Words as symbols govern much of what we do. /P.22/

According to Bourne, language is an internal mediator of behavior; verbal responses can be overt or covert. From this traditional perspective, speech is viewed as simply the overt expression of language. However, Liberman (1970) has suggested that "speech is truly an integral part of language, not merely a convenient vehicle for transmitting it" (p. 304).

From the perspective of the speech behavior theorist, then, speech as explicit verbal behavior can produce unique cognitive effects. Vygotsky (1962), in support of the functional relationship between young children's speech and cognitive processes, offered the following observation:

> A child of five and a half was drawing a streetcar when the point of his pencil broke. He tried, nevertheless, to finish the circle of a wheel, pressing down very hard, but nothing showed on the paper except a deep colorless line. The child muttered to himself, "It's broken," put aside the pencil, took watercolors instead, and began drawing a broken streetcar after an accident, continuing to talk to himself from time to time about the change in his picture. The child's accidentally provoked egocentric utterance so manifestly affected his activity that it is impossible to mistake it for a mere by-product, an accompaniment not interfering with the melody. [P. 17]

Thus, the speech theorist sees children's speech as more than an index of implicit verbal responses; rather, it is a vital link between language and thought.

The intent of the proposed project is to discover the conditions under which overt verbalization aids children's learning. Attention will be devoted to chronological and mental age differences, and also to the types of materials to be learned.

Relation to Other Center Research

The proposed project directly relates to the ongoing basic research in Program I. In one of the experiments to be described (see Research Strategy), a hypothesis concerning overt verbalization and imagery in nursery school children is advanced. Also, individual differences in children's speech behavior will be examined.

Implications for Elementary Education

Some current educational practices implicitly employ speech-oriented learning situations (e.g., show-and-tell, oral recitation, and so on). For example, Van Riper and Butler (1955) offered the following speculations:

> Our conclusion was that self-talk has a real utility. It serves as the vehicle for teaching the child to think. Perhaps the child knows what all the educators have forgotten--that it is possible to learn to think, and that the initial step in acquiring this facility is through self-talk. By associating verbal symbols with all the features of his experience he gains the ability to use that experience in the future. He can remember it more easily; he can fit it into new patterns. . . .
>
> Little children know instinctively that thought must be fluent to be effective. They know that autistic speech is the one basic invention which gives them mastery of the future. It is the peculiarly human gift. Having just mastered the use of this magical tool, small children are busy using it. They express what they see; they say what they do; they tell what they feel. They are trying hard to learn how to talk to themselves fluently. [Pp. 115-116]

Although one can find occasional references to "self-talk" or "thinking aloud" in educational literature, little is known about the conditions in which children's speech aids or inhibits learning. Consequently, research needs to be done before specific classroom practices are recommended.

II

RELATED RESEARCH FROM PREVIOUS PROJECT

Research on speech processes and learning began at the Wisconsin Research and Development Center as a Satellite Project in September, 1969 (Project 307: Letter-Sound Relationships). During that initial period, specific training procedures for teaching children to discriminate the sounds which make up a word were pursued. This research was based on Soviet research (Elkonin, 1963) which suggested that speech training (i.e., having children say the sounds which make up a word after the experimenter pronounces these sounds) facilitates learning and transfer in letter-sound correspondences. However, a replication of the Elkonin experiment was unsuccessful (Wilder, in preparation); therefore, other tasks more amenable to experimental control were undertaken.

Two experiments with adults stimulated the study of speech behavior in children. First, Wilder and Harvey (in press) examined overt and covert verbalization in a problem-solving paradigm, and found that high school subjects profit from instructions to overtly or covertly produce task-related verbalizations as compared to subjects not instructed to verbalize. In the second experiment, it was found that spoken rehearsal is superior to silent rehearsal in verbal discrimination learning (Wilder, in press).

PS 005411

Based on these preliminary findings, extensive research with children was undertaken in FY 71. Verbal and visual discrimination learning tasks were administered to over 300 nursery school, fifth-grade, and college students. These experiments were designed to examine the difference between explicit and implicit verbalization in various age groups. While the frequency theory of verbal discrimination learning (see Ekstrand, Wallace & Underwood, 1966) makes no distinction between implicit and explicit verbal responses, our studies suggest the following: (1) spoken rehearsal is superior to silent rehearsal for all age groups in visual and verbal discrimination learning, (2) choosing the correct item by pronouncing it is superior to choosing the item by pointing at it for nursery school subjects on the visual discrimination task, but this difference in response modality was not significant for fifth graders or college students (Wilder, in preparation).

The second finding supports an internalization-of-speech hypothesis; that is, while older children and adults implicitly verbalize when pointing to the item of their choice, younger children tend not to. Thus, while older subjects do not profit from pronouncing the item of their choice, nursery children do. One possible explanation for the beneficial effects of spoken rehearsal for all age groups is that silent rehearsers probably attend to the incorrect item as well as the correct item during rehearsal, which detracts from performance.

In the light of the significant spoken rehearsal effect found for all age groups, another experiment was conducted utilizing instructions to verbalize covertly. It was found that if adults are instructed to

pronounce the correct item silently, this covert rehearsal also is superior to silent rehearsal, in which subjects are given no verbalization instructions. In addition, there was no significant difference between overt and covert rehearsal (Wilder, in preparation).

III

RESEARCH STRATEGY

FY 72

Based on studies conducted thus far, FY 72 research will be directed toward modifying developmental trends reported in the literature to account for overt speech behavior, and beginning consideration of actual classroom activities utilizing overt verbalization. Three experiments are proposed for FY 72, and will be reported in Technical Reports and a Needs and Specifications paper on speech behavior in the elementary school classroom.

The first experiment concerns the finding that imagery becomes a more effective facilitator of learning as children grow older. Davidson (in preparation), for example, has found that neither imagery depiction nor sentence context is sufficient to produce negative transfer in nursery school children. This study suggests that there must be a simultaneous verbal-tag store for imagery to be an effective variable in young children's learning. However, what if children learned paired associates by overtly pronouncing the pairs (as compared to silent performance) in the imagery condition? Such a manipulation should combine imagery and semantic components for nursery school children, and consequently would improve learning.

This finding would suggest that, while nursery school children do not normally "read" the interaction that is depicted in imposed images, overt verbalization activates the association.

The second experiment deals with the conclusion that overt verbalization of both items in a discrimination task is facilitative for nursery school children and detrimental for older children and adults (Goulet, 1969; Goulet & Hoyer, 1969). This finding is confounded by differing verbalization procedures in the two studies. The nursery school children pronounced both items before choosing the correct item, while the older children pronounced both items after making their choice. Consequently, it is hypothesized that having fifth graders pronounce both items before choosing the correct item will not hinder learning, and that having nursery school children pronounce both items after making their choice will hinder learning.

The third experiment concerns the effectiveness of covert verbalization instructions in younger children's learning. If it is true that younger children have not yet developed implicit verbal responses, then instructions to pronounce items silently (which are effective with adults) should be ineffective.

The FY 72 research will be integrated into a Needs and Specifications paper dealing directly with the issue of speech in the elementary school

classroom. What kinds of activities promote overt verbal behavior, and do these activities lead to better learning? How can these speech activities be integrated into the typical elementary school classroom?

General Research Goals

In broad perspective, the Speech and Cognitive Learning project is conceived on two interrelated levels: research and application. The research through FY 72, combined with theories and research already published, will provide the necessary information for a book, Speech and Cognitive Processes in Young Children.

The second level of the Speech and Cognitive Learning project, application, will begin after FY 72. Based on the FY 72 Needs and Specifications paper, research in the elementary school classroom will begin. This research will culminate with an educationally-oriented text, Speech Behavior in the Elementary School Classroom.

GPO 825-006-3

REFERENCES

Bourne, L. E. Human conceptual behavior. Boston: Allyn and Bacon, 1966.

Davidson, R. E. Verbalization and imagery in transfer. Technical Report, Wisconsin Research and Development Center for Cognitive Learning, in preparation.

Ekstrand, B. R., Wallace, W. P., & Underwood, B J. A frequency theory of verbal discrimination learning. Psychological Review, 1966, 73, 566-578.

Elkonin, D. B The psychology of mastering the elements of reading. In B. Simon & J. Simon (Eds.), Educational psychology in the U.S.S.R. London: Pergamon Press, 1963.

Goulet, L. R. The effect of verbalization on discrimination learning in nursery school children. Journal of Experimental Child Psychology, 1969, 7, 479-484.

Goulet, L. R., & Hoyer, W. J. The effect of verbalization on verbal discrimination learning and associative recall in young children and adults. Journal of Experimental Child Psychology, 1969, 7, 434-439.

Liberman, A. M. The grammars of speech and language. Cognitive Psychology, 1970, 1, 301-323.

Van Riper, C., & Butler, K. G. Speech in the elementary school classroom. New York: Harper & Row, 1955.

Vygotsky, L. S. Thought and language. Cambridge, Mass.: MIT Press, 1962.

Wilder, L. Spoken rehearsal and verbal discrimination learning. Working Paper, Wisconsin Research and Development Center for Cognitive Learning, in press.

Wilder, L., & Harvey, D. J. Overt and covert verbalization in problem solving. Working Paper, Wisconsin Research and Development Center for Cognitive Learning, in press.

Wilder, L. Analysis training: Failure to replicate Elkonin. Technical Report, Wisconsin Research and Development Center for Cognitive Learning, in preparation.

Wilder, L. Overt and covert rehearsal in verbal discrimination learning. Working Paper, Wisconsin Research and Development Center for Cognitive Learning, in preparation.

Wilder, L. Spoken responses during verbal and visual discrimination learning. Working Paper, Wisconsin Research and Development Center for Cognitive Learning, in preparation.

GPO 825-006-2